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**Date:** September 17, 2014  
**To:** Jerry Bingham, AFCEC COR  
**CC:** Don Gronstal, AFCEC; Calvin Cox, CNGS; and Susan Soloyanis, Sologeo  
**From:** David Daftary, Shaw  
**Subject:** Former George AFB - Fall 2014 Basewide Groundwater Sampling Event

The fall 2014 groundwater monitoring event is scheduled for September/October 2014 and will include gauging the depth-to-water for all groundwater monitoring and extraction wells and analyzing groundwater samples from selected wells for volatile organic compounds (VOCs), general chemistry, and total dissolved solids (TDS). The methods and analytical suites for groundwater sampling are provided in the Draft UFP QAPP (Shaw, 2012a). The list of monitoring wells to be sampled is provided as Table 1.

The overall objectives of this groundwater monitoring event are to:

- Verify compliance with the ROD (OU1)
- Monitor seasonal variation in groundwater elevation and flow patterns, and
- Monitor concentrations and areal extent of contaminants of concern (COCs).

There is only one site associated with this basewide groundwater monitoring event: CG070. Some of the monitoring wells are also used to monitor multiple plumes and the data collected will be used for reporting on more than one site. The list of monitoring wells to be sampled was determined during a workshop that CB&I and the Air Force held with the RWQCB and the EPA on August 26<sup>th</sup> and 27<sup>th</sup>. Table 1 includes the well identification, aquifer, screen depth, associated site(s), analysis to be performed and rationale for sampling in October 2014. Changes from the previous fall (October 2013) sampling event are listed by site in the following sections:

**CG070.** Site CG070 consists of a TCE groundwater plume present in the Upper and Lower Aquifers in the northeastern portion of the former George AFB and is part of OU1. Figures 1 and 2 identify the wells that will be sampled for VOCs in October 2014 in the Upper and Lower Aquifers, respectively. Groundwater samples will be collected from 88 CG070 wells for VOC analysis. Locations that were sampled in October 2013, but will not be sampled in October 2014, are listed below:

### **Upper Aquifer TCE Plume**

- NZ-94

### **Lower Aquifer TCE Plume**

- NZ-73
- NZ-100
- NZ-130c
- NZ-132b
- NZ-135b

### **Flood Plain Aquifer**

- NZ-132c
- NZ-135c

There are no OU3 wells are currently scheduled for sampling during this event (Fall 2014). OU3 locations that were sampled in October 2013, but will not be sampled in October 2014, are listed below:

### **SS030**

- |         |          |          |
|---------|----------|----------|
| • MW-04 | • MW-42  | • MW-99  |
| • MW-13 | • MW-43  | • MW-109 |
| • MW-21 | • MW-46  | • MW-110 |
| • MW-23 | • MW-47  | • MW-111 |
| • MW-26 | • MW-55  | • MW-112 |
| • MW-28 | • MW-57  | • MW-113 |
| • MW-29 | • MW-69  | • MW-114 |
| • MW-34 | • MW-70B | • MW-115 |

### **SS030/OT069**

- |         |         |
|---------|---------|
| • MW-31 | • MW-58 |
| • MW-45 | • MW-71 |

### **OT069**

- |         |         |          |
|---------|---------|----------|
| • MW-30 | • MW-74 | • MW-91  |
| • MW-48 | • MW-75 | • MW-141 |

### **OT069/ST067b**

- MW-133

**ST067b**

- MW-117
- MW-121
- MW-123
- MW-124
- MW-125
- MW-130
- MW-131
- MW-132
- MW-134
- MW-137
- NZ-119

**ST067b/OT071**

- MW-136
- MW-142
- MW-143
- MW-144
- MW-151

**OT071**

- Adelanto 4
- MW-145
- MW-146
- MW-147
- MW-148
- MW-149
- MW-152
- NZ-64
- NZ-65
- NZ-66
- NZ-89
- NZ-91
- NZ-120
- NZ-121
- NZ-122
- NZ-123
- NZ-124
- NZ-125

In summary, a total of 79 wells will be sampled during the upcoming October 2014 basewide groundwater monitoring event, and sample analysis will include 88 VOC samples, 13 general chemistry samples, and 13 TDS samples. All of the wells will be gauged for depth-to-water or depth-to-product. Gauging and groundwater monitoring will be performed in accordance with the Draft UFP-QAPP (Shaw, 2012a). Sampling results from the October 2014 groundwater monitoring event will be reported in the 2014 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites.

## **Tables**

Table 1 – Monitoring Well Summary, October 2014 Basewide Groundwater Monitoring Event

## **Figures**

Figure 1 – CG070 Upper Aquifer Proposed Well Sampling

Figure 2 – CG070 Lower Aquifer Proposed Well Sampling

## **References**

MWH, 2011, *Final 2010 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California*, August.

MWH, 2012, *Final 2011 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California*, August.

Shaw, 2013, *Final 2012 Basewide Annual Monitoring and Operations Report for CERCLA and Non-CERCLA Sites, George Air Force Base, California*, May.

Shaw, 2012a, *Draft Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) Quality Program Plan – Volume 1, Former George Air Force Base, Victorville, California*, August.

## TABLES

Table 1  
Wells Proposed for Sampling - Oct 2014  
OU1, Former George AFB

Well	Bottom of Screen (mean sea level)	Top of Screen (mean sea level)	Sample In October 2014? (Yes or No)	Screen Interval (below ground surface)	Oct 2013 DTW (below top of casing)	Pump Placement (below top of casing)	Analytes			Rationale
Upper Aquifer							8260B	Chemistry (Ca, Mg, Na, K, SO4, NO3, HCO3)	TDS	
FT-01	2672.62	2712.12	No	--	--	--				7, 10
FT-02	2655.57	2690.57	No	--	--	--				7, 10
FT-03	2667.57	2702.57	Yes	133-168	116.46	138 ft btoc	X			1, 8
FT-04	2669.07	2704.07	Yes	134-169	118.53	middle of column	X			1, 8
FT-05	2709.81	2719.81	Yes	117-127	117.91	middle of column	X			1, 8
MW-35	2744.97	2704.97	No	--	--	--				7, 10
MW-102-OU1	2662.8	2682.2	Yes	155-175	125.6	middle of column	X			1, 8
MW-103-OU1	2705.7	2729.5	Yes	110-134	107.88	middle of column	X			6
MW-104-OU1	2673	2696	No	--	--	--				7, 10
MW-105	2687.97	2707.97	Yes	114-134	105.1	119 ft btoc	X	X	X	6, 7, 9
MW-106	2642.45	2671.45	No	--	--	--				7, 10
MW-141	2746.48	2726.48	Yes	115-135	125.44	5 ft below water table	X			6
NZ-06	2680.43	2660.43	Yes	138-158	113.48	143 ft btoc	X			6, 8
NZ-07	2671.45	2701.45	Yes	100-130	86.72	middle of column	X			8
NZ-10	2669.38	2699.38	No	--	--	--				7, 10
NZ-101	2704.41	2724.41	Yes	91-111	103.12	5 ft below water table	X			4
NZ-102	2699.84	2719.84	Yes	96-116	103.54	5 ft below water table	X			2, 8
NZ-103	2680.04	2700.04	Yes	57-77	45.03	middle of column	X			7, 8
NZ-11	2672.67	2702.67	Yes	115-145	112.11	5 ft below water table	X			8
NZ-111	2697.24	2737.24	Yes	100-140	116.12	5 ft below water table	X			6, 8
NZ-116	2723.52	2743.52	Yes	120-140	129.63	5 ft below water table	X			8
NZ-12	2674.29	2704.29	Yes	120-150	110.01	middle of column	X			8
NZ-126	2676.00	2700.00	Yes	115-135	107.94	middle of column	X			2
NZ-17	2722.08	2732.08	No	--	--	--				7, 10
NZ-18	2707.46	2717.46	Yes	122-132	120.58	middle of column	X			4
NZ-20	2662.95	2672.95	Yes	151-161	139.17	156 ft btoc	X	X	X	5, 8, 9
NZ-21	2693.34	2708.34	Yes	100-115	92.94	105 ft btoc	X			4, 9
NZ-22	2665.71	2675.71	Yes	131-141	94.82	135 ft btoc	X			8
NZ-23	2689.63	2699.63	Yes	135-145	117.12	140 ft btoc	X			8
NZ-24	2686.46	2696.46	Yes	130-140	112.12	135 ft btoc	X			8
NZ-25	2683.75	2693.75	Yes	110-120	90.89	115 ft btoc	X			7, 8
NZ-27	2676.61	2686.61	Yes	77-87	61.24	82 ft btoc	X			6, 8
NZ-28A	2680.1	2710.1	Yes	57-87	58.79	middle of column	X			7
NZ-30	2657.51	2667.51	Yes	150-160	159.75	dry no sample	X			8
NZ-31	2649.36	2659.36	Yes	145-155	147.94	middle of column	X			2
NZ-32	2649.36	2659.36	Yes	116-136	102.14	121 ft btoc	X	X	X	2, 8, 9
NZ-33	2679.13	2689.13	Yes	155-165	120.92	middle of column	X			1, 6
NZ-34	2713.5	2723.5	Yes	92-102	96.92	middle of column	X			8

Table 1  
Wells Proposed for Sampling - Oct 2014  
OU1, Former George AFB

Well	Bottom of Screen (mean sea level)	Top of Screen (mean sea level)	Sample In October 2014? (Yes or No)	Screen Interval (below ground surface)	Oct 2013 DTW (below top of casing)	Pump Placement (below top of casing)	Analytes			Rationale
Upper Aquifer							8260B	Chemistry (Ca, Mg, Na, K, SO4, NO3, HCO3)	TDS	
NZ-35	2698.64	2708.64	Yes	105-115	95.46	110 ft btoc	X			6
NZ-36	2687.7	2697.7	Yes	120-130	106.44	125 ft btoc	X			2, 8
NZ-39	2677.61	2697.61	Yes	116-136	109.66	middle of column	X			2, 8
NZ-40	2657.22	2667.22	No	--	--	--				7, 10
NZ-42	2669.06	2689.06	No	--	--	--				7, 10
NZ-43	2672.81	2702.81	Yes	127-157	114.85	middle of column	X			2, 8
NZ-46	2662.97	2677.97	No	--	--	--				7, 10
NZ-49	2673.38	2693.38	Yes	117-137	111.16	middle of column	X			4
NZ-51	2696.42	2716.42	Yes	131-152	139.95	middle of column	X			4
NZ-52	2688.06	2708.06	Yes	142-162	153.44	middle of column	X			4
NZ-54	2703.7	2723.7	Yes	125-145	130.53	middle of column	X			6
NZ-55	2707.22	2727.22	Yes	108-128	99	middle of column	X			8
NZ-56	2707.96	2727.96	Yes	111-131	121.21	middle of column	X			8
NZ-67	2690.14	2710.14	Yes	65-86	71.8	middle of column	X			4
NZ-68	2715.89	2735.89	Yes	122-142	132.62	middle of column	X			4
NZ-81	2690.37	2705.37	Yes	143-158	148.7	middle of column	X			4, 8
NZ-82	2710.07	2725.07	Yes	107-122	110.45	5 ft below water table	X	X	X	6, 9
NZ-83	2710.72	2722.12	Yes	112-124	115.95	5 ft below water table	X			6
NZ-93	2678.3	2698.3	Yes	115-135	121.73	middle of column	X			2, 7
NZ-94	2703.02	2723.02	No	--	--	--				7, 10
NZ-95	2728.48	2748.48	No	--	--	--				7, 10
NZ-96	2723.09	2743.09	No	--	--	--				7, 10
NZ-97	2731.37	2751.37	Yes	97-117	108.42	middle of column	X			4, 7
NZ-99	2689.34	2709.34	Yes	96-116	107.52	middle of column	X			3, 7

**MNA Guidance on Wells for "Target Zones"**

- 1) Source areas - within and immediately downgradient of remediated source areas
- 2) Transmissive zones with highest contaminant concentrations or hydraulic conductivity
- 3) Distal or fringe portions of the plume
- 4) Plume boundaries and other compliance boundaries
- 5) Zones in which contaminant reduction rates appear to be lower than required to meet remediation goals (i.e., recalcitrant zone)
- 6) Areas representative of contaminated and uncontaminated geochemical settings
- 7) Areas supporting the monitoring of site hydrology

**Additional Rationale**

- 8) Included to confirm the decay curve
- 9) General chemistry sample to assess movement from the upper to the lower aquifer

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Upper Aquifer							8260B	Chemistry (Ca, Mg, Na, K, SO4, NO3, HCO3)	TDS	

10) Excluded (highlighted in green) from sampling for chemistry but included for water-level measurements.  
These wells were determined during the workshop held on August 26th and 27th with the EPA, RWQCB, Air Force, and CBI.



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Lower Aquifer							8260B	General Chemistry (Ca, Mg, Na, K, SO4, NO3, HCO3)	TDS	
EW-17	2517.24	2567.24	No			--				7, 10
EW-6	2503.1	2573.1	Yes	160-230	132.28	middle of column	X			2
LW-1	2543.35	2581.85	Yes	64-103	48.30	middle of column	X			4, 6
LW-2	2542.35	2601.93	No	--	--	--				7, 10
LW-3	2569.5	2584.67	Yes	40-60	13.85	45 ft btoc	X			4
MW-107	2559.01	2579.01	No			--				7, 10
MW-37	2585.57	2545.57	Yes	270-310	259.74	middle of column	X			4
NW-2	2567.13	2567.13	No	--	--	--				7, 10
NW-3	2523.36	2567.03	No	--	--	--				7, 10
NZ-02	2534.7	2554.7	No	--	--	--				7, 10
NZ-03	2578.1	2598.1	Yes	130-150	127.82	middle of column	X			6
NZ-100	2554.46	2574.46	No			--				7, 10
NZ-104	2567.82	2587.82	Yes	117-137	100.42	middle of column	X			4
NZ-105R	2571.4	2591.4	Yes	170-190	158.41	middle of column	X			6
NZ-106	2576.71	2596.71	Yes	210-230	203.18	middle of column	X	X	X	3, 6
NZ-107	2572.93	2592.73	Yes	260-280	252.61	middle of column	X	X	X	2, 9
NZ-108	2579.9	2599.9	No	--	--	--				7, 10
NZ-112	2575.1	2595.1	Yes	180-200	174.3	middle of column	X			4
NZ-113	2575.4	2595.4	Yes	133-153	128.5	middle of column	X			4
NZ-114	2578.35	2598.35	No	--	--	--				7, 10
NZ-127b	2541	2561	Yes	290-310	257.3	300 ft btoc	X			4
NZ-127c	2491	2511	Yes	340-360	251.72	350 ft btoc	X			4
NZ-128b	2524	2544	No	--	--	--				7, 10
NZ-128c	2494	2514	No	--	--	--				7, 10
NZ-129b	2523	2543	Yes	290-310	232.8	302 ft btoc	X			6
NZ-129c	2493	2513	Yes	320-340	232.64	332 ft btoc	X			6
NZ-13	2534.7	2554.7	Yes	155-185	147.9	middle of column	X	X	X	4, 9
NZ-130a	2584	2604	Yes	155-175	155.07	168 ft btoc	X	X	X	4, 9
NZ-130b	2522	2542	No	--	--	--				7, 10
NZ-130c	2491	2511	No	--	--	--				7, 10
NZ-131a	2548.91	2538.91	No	--	--	--				7, 10
NZ-131b	2620.82	2600.82	No	--	--	--				7, 10
NZ-131c	2493.91	2513.91	No	--	--	--				7, 10
NZ-138	NS	NS	NS	130-150	--	middle of column	X	X	X	2, 7, 9
NZ-139	NS	NS	NS	130-150	--	middle of column	X	X	X	2, 7, 9
NZ-29	2565.82	2575.82	No	--	--	--				7, 10
NZ-37	2567.94	2577.94	Yes	132-142	107.04	137 ft btoc	X			4
NZ-41	2554.36	2569.26	Yes	110-125	75.44	115 ft btoc	X			4

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OU1, Former George AFB

Well	Bottom of Screen (mean sea level)	Top of Screen (mean sea level)	Sample In October 2014? (Yes or No)	Screen Interval (below ground surface)	Oct 2013 DTW (below top of casing)	Pump Placement (below top of casing)	Analytes			Rationale (see notes section below)
Lower Aquifer							8260B	General Chemistry (Ca, Mg, Na, K, SO4, NO3, HCO3)	TDS	
NZ-44	2550.11	2570.11	Yes	252-273	221.27	257 ft btoc	X	X	X	4
NZ-48	2550.71	2570.71	Yes	140-160	108.5	45 ft btoc	X			4, 6
NZ-50	2530.29	2570.29	Yes	235-275	210.68	middle of column	X			4
NZ-57	2576.01	2596.01	Yes	102-122	96.45	middle of column	X			6
NZ-58	2576.43	2596.43	Yes	142-163	140.07	middle of column	X			4
NZ-69	2572.06	2592.06	Yes	132-152	117.1	middle of column	X			6
NZ-70	2570.75	2590.75	No	--	--	--				7, 10
NZ-71	2528.72	2548.72	No	--	--	--				7, 10
NZ-72	2572.56	2592.56	Yes	200-220	200.11	middle of column	X			4
NZ-73	2567.56	2587.56	No	--	--	--				7, 10
NZ-74	2570.21	2590.21	No	--	--	--				7, 10
NZ-76	2535.15	2555.15	Yes	136-156	95.61	141 ft btoc	X			4,6
NZ-78	2529.77	2549.77	No	--	--	--				7, 10
NZ-80	2567.02	2587.02	Yes	258-278	247.04	middle of column	X	X	X	2, 9
NZ-84	2576.95	2591.95	Yes	241-256	232.32	middle of column	X	X	X	2, 9
NZ-85	2568.75	2583.75	Yes	190-205	151.16	195 ft btoc	X	X	X	4
NZ-86	2559.23	2579.23	No	--	--	--				7, 10
NZ-98	2570.4	2590.4	Yes,	226-246	218.45	231 ft btoc	X			4
RZ-02	2534.69	2514.69	Yes	310-330	247.64	315 ft btoc	X			4

**MNA Guidance on Wells for "Target Zones"**

- 1) Source areas - within and immediately downgradient of remediated source areas
- 2) Transmissive zones with highest contaminant concentrations or hydraulic conductivity
- 3) Distal or fringe portions of the plume
- 4) Plume boundaries and other compliance boundaries
- 5) Zones in which contaminant reduction rates appear to be lower than required to meet remediation goals (i.e., recalcitrant zone)
- 6) Areas representative of contaminated and uncontaminated geochemical settings
- 7) Areas supporting the monitoring of site hydrology

**Additional Rationale**

- 8) Included to confirm the decay curve
- 9) General chemistry sample to assess movement from the upper to the lower aquifer
- 10) Excluded (highlighed in green) from sampling for chemistry but included for water-level measurements.

These wells were determined during the workshop held on August 26th and 27th with the EPA, RWQCB, Air Force, and CBI.

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Flood Plain Aquifer							8260B	General Chemistry (Ca, Mg, Na, K, SO4, NO2, Alkalinity)	TDS	
EW-15	2517.41	2567.41	No	--	--	--				7, 10
LW-4	2613.17	2628.34	No	--	--	--				7, 10
MW-1-BIO	2497.19	2577.19	No	--	--	--				7, 10
MW-2-BIO	2588.47	2568.47	No	--	--	--				7, 10
MW-3-BIO	2602.25	2562.25	No	--	--	--				7, 10
NW-1	2555.16	2578.16	No	--	--	--				7, 10
NZ-132b	2523	2543	No	--	--	--				7, 10
NZ-132c	2530.5	2550.5	No	--	--	--				7, 10
NZ-133b	2500	2520	Yes	65-85	13.3	76 ft btoc	X			4
NZ-133c	2500	2520	No	--	--	--				7, 10
NZ-134b	2523	2543	No	--	--	--				7, 10
NZ-134c	2493	2513	No	--	--	--				7, 10
NZ-135b	2520	2540	No	--	--	--				7, 10
NZ-135C	2458	2478	No	--	--	--				7, 10
NZ-140	NS	NS	NS	2-12	--	middle of column	X	X	X	4, 7, 9
NZ-77	2532.08	2552.08	Yes	68-88	32.12	76 ft btoc	X			4
OW-1	2576.75	2584.75	Yes	34-26	12.51	39 ft btoc	X			4
OW-2	2516	2466	No	--	--	--				7, 10
OW-3	2504.48	2464.48	No	--	--	--				7, 10
OW-6	2544.68	2559.85	Yes	12-28	4.64	middle of column	X			4

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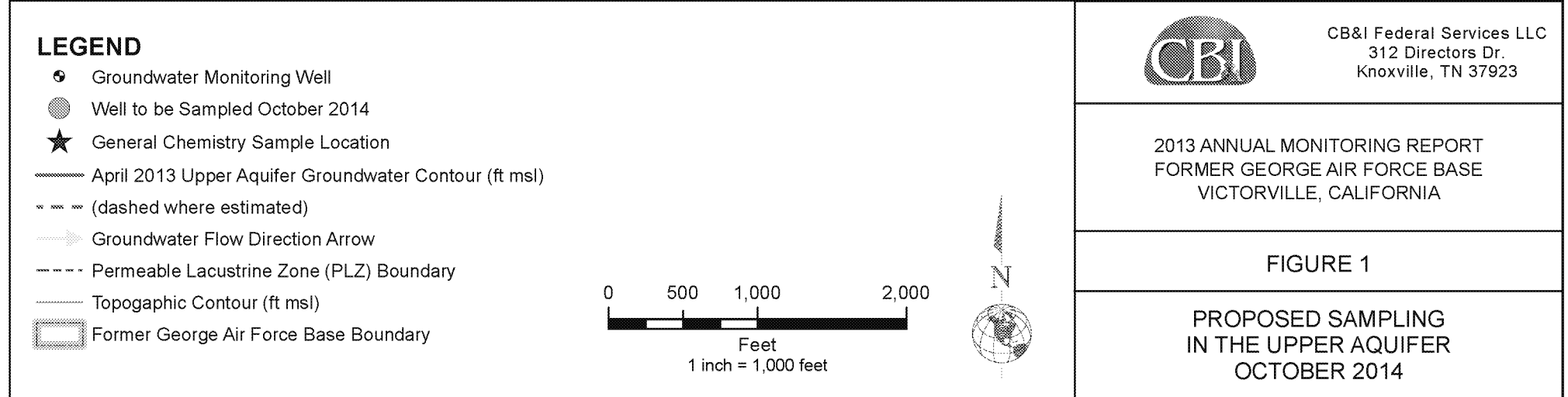
**Additional Rationale**

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- 9) General chemistry sample to assess movement from the upper to the lower aquifer
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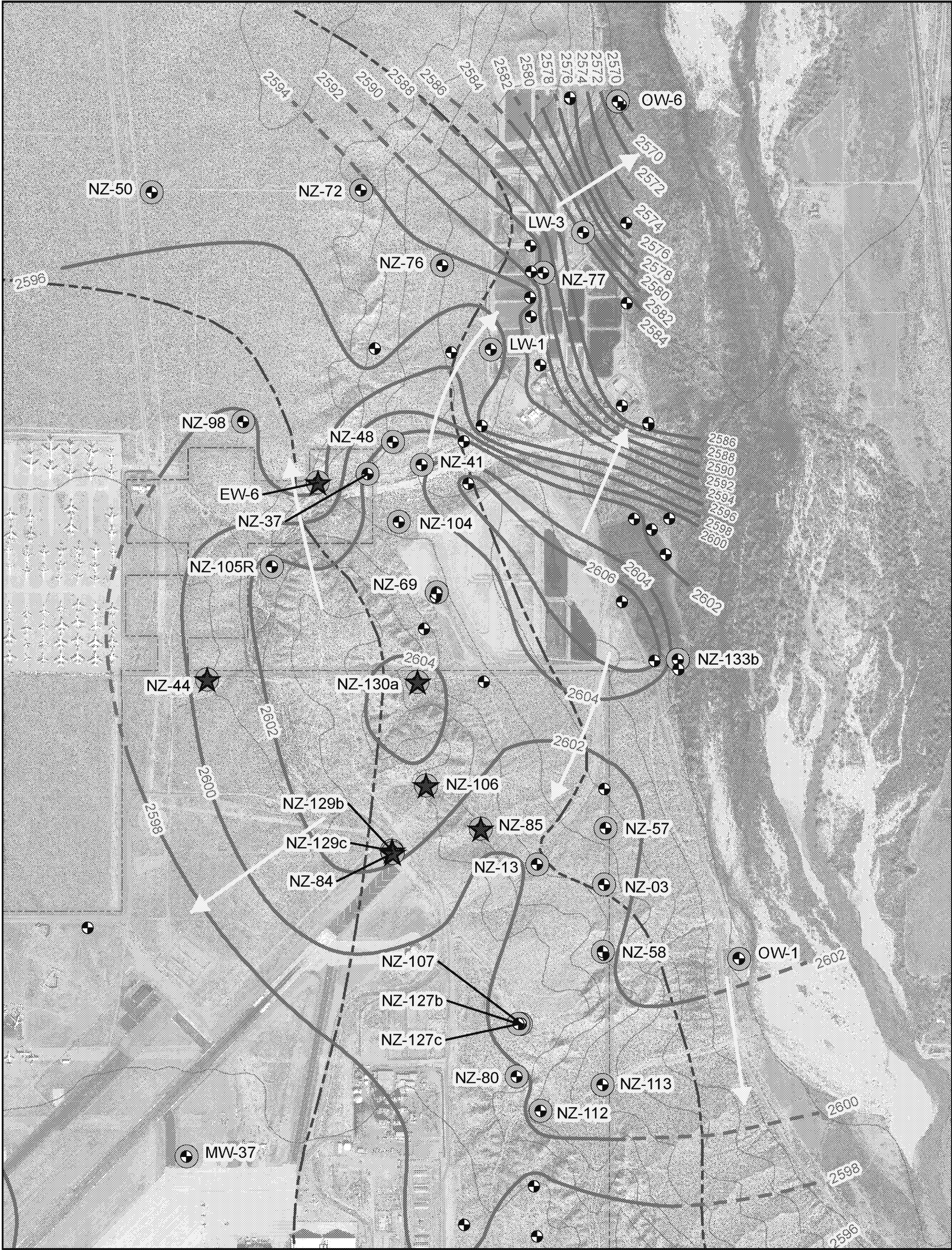
These wells were determined during the workshop held on August 26th and 27th with the EPA, RWQCB, Air Force, and CBI.

## FIGURES



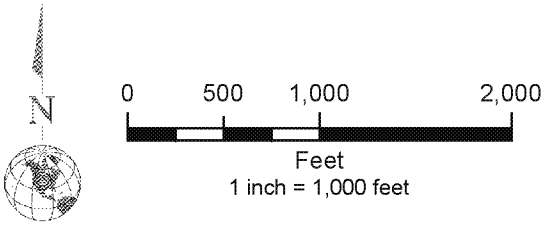






**LEGEND**

- Groundwater Monitoring Well
- Well to be Sampled October 2014
- General Chemistry Sample Location
- April/May 2014 Lower Aquifer Groundwater Contour (ft msl)  
(dashed where estimated)
- Groundwater Flow Direction Arrow
- Permeable Lacustrine Zone (PLZ) Boundary
- Topographic Contour (ft msl)
- Former George Air Force Base Boundary



CB&I Federal Services LLC  
312 Directors Dr.  
Knoxville, TN 37923

OU1 ROD AMENDMENT  
FORMER GEORGE AIR FORCE BASE  
VICTORVILLE, CALIFORNIA

FIGURE 2

PROPOSED SAMPLING  
IN THE LOWER AQUIFER  
OCTOBER 2014